Remarks

The present application includes claims 1-20. Claims 1-20 were rejected in the Office action mailed May 14, 2003. By this Amendment, claims 13-20 have been canceled without prejudice so that they may be pursued in a continuation application. New claim 21 has been added in order to assist in the clarification of Claim 12. Claim 12, in turn, has been amended to depend from new claim 21. Support for new claim 21 can be found at page 13, lines 4-6 of the specification. Claim 2 has been amended for clarification, and claim 8 has been amended to correct a typographical error.

The applicants respectfully submit that pending claims 1-12 and 21 are patentable for the reasons provided below.

Examiner's Interview

The applicants thank the Examiner for his courtesy extended during a telephonic interview with the undersigned attorney for applicants on August 6, 2003. The patent to Ferrier (6,162,503) was discussed, but no agreement was reached.

35 U.S.C. § 103 (Non-obviousness)

Claims 1, 2, 10 and 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ferrier (6,162,503). The applicants respectfully submit that these claims are non-obvious, for the reasons provided below.

Claim 1 recites a process for preparing a roughened copper surface which involves the step of contacting a copper surface with an adhesion promoting composition. The adhesion promoting composition contains an oxidizer (e.g. hydrogen peroxide), a pH adjuster (an acid), a topography modifier and a uniformity enhancer. The topography modifier is described in the applicants' specification as a five membered aromatic fused N-

heterocyclic ring compound with at least one nitrogen atom in the N-heterocyclic ring, where at least one of the nitrogen atoms in the heterocyclic ring is bonded to a hydrogen atom. Suitable topography modifiers include 1H-benzotriazole and 1H-benzimidazole. The uniformity enhancer is described in the specification as a tetrazole. The applicants discovered that this unique combination of a tetrazole with the oxidizer, the pH adjuster and the topography modifier led to the formation of a uniformly coated and roughened surface.

Ferrier '503 also teaches the application of an adhesion promoting composition to a copper surface. The composition of Ferrier '503 contains an oxidizer, an acid, and a "corrosion inhibitor," among other components. Ferrier '503 does not teach the use of components named "topography modifier" or "uniformity enhancer." However, the specification of Ferrier '503 states that "[p]referred corrosion inhibitors are selected from the group consisting of triazoles, benzotriazoles, tetrazoles, imidazoles, benzimidazoles and mixtures of the foregoing." Col. 5, lines 32-36. The position taken in the Office action appears to be that the corrosion inhibitor of Ferrier '503 could be a "mixture" of a benzotriazole or benzimidazole ("topography modifiers" according to the present invention) and a tetrazole (a "uniformity enhancer" according to the present invention). In other words, since the specification of Ferrier '503 uses the language "mixtures of the foregoing," it would be obvious to one of ordinary skill in the art to make the particular combination of a benzotriazole or benzimidazole with a tetrazole, thereby arriving at the adhesion promoting composition used in applicants' inventive process.

The applicants submit that a skilled artisan would not find it obvious from the teachings of Ferrier '503 to select a corrosion inhibitor that is a mixture of a benzotriazole

or benzimidazole with a tetrazole. There in nothing in the specification of Ferrier '503 to suggest that such a combination would have any particular benefit. None of the examples in Ferrier '503 make use of a mixture of a benzotriazole or benzimidazole with a tetrazole. In fact, no tetrazole is used in any example of Ferrier '503. The focus of Ferrier '503 is instead on additional components that are added to the adhesion promoting composition to improve adhesiveness, in particular, a benzotriazole with an electron withdrawing group in the 1-position (e.g. hydroxybenzotriazole) and "adhesion enhancing species" (molybdates, tungstates, etc.). Col. 5, line 40 through col. 6, line 34. At best, Ferrier '503 suggests that the use of a tetrazole/benzotriazole/benzimidazole mixture could be an equivalent substitute for the benzotriazole corrosion inhibitor that is used throughout the examples.

Applicants, on the other hand, discovered that there is an unexpected benefit to adding a tetrazole to an adhesion promoting composition which contains an oxidizer, a pH adjuster and a topography modifier. In particular, the use of a tetrazole leads to a more uniformly coated and etched copper surface. Applicants have submitted, simultaneously with this Amendment, the declaration of applicant Roger Bernards which describes the unexpected and unique nature of this discovery, which is also reflected in applicants' specification.

As Mr. Bernards explains in his declaration, he conducted several experiments comparing an adhesion promoting composition that contained a tetrazole with an adhesion promoting composition that did not contain a tetrazole. Bernards Dec. ¶ 4. These experiments are described as Examples 1-3 in the patent application. Bernards Dec. ¶ 4. In Examples 1 and 2, Mr. Bernards used an adhesion promoting composition

that contained an oxidizer (hydrogen peroxide), a pH adjuster (sulfuric acid), and a topography modifier (benzotriazole), but which did not contain a tetrazole. Bernards Dec. ¶¶ 5-6, 8; specification, page 19.

When applied to a copper surface, the composition of Example 1 both etched and modified the surface. However, the etched surface was undesirably speckled with shiny spots of copper, indicating a non-uniform etch. Bernards Dec. ¶ 7. Similarly, the composition of Example 2 both etched and modified the copper surface, but the etched surface developed undesirable striations that were indicative of a non-uniform etch. Bernards Dec. ¶ 8.

Mr. Bernards used a tetrazole in Example 3. In particular, he applied the following composition to a copper surface: 3% hydrogen peroxide, 5% sulfuric acid, 1.5 g/l benzotriazole, 0.5 g/l ***5-Aminotetrazole***, and the balance deionized water. This tetrazole-containing adhesion promoting composition both etched and modified the copper surface. Unlike Examples 1 and 2 however, the etched surface was desirably uniformly etched. Bernards Dec. ¶ 9. These same results are provided in the specification of the application. *See* page 17, Examples 1-3 and Table 1 on page 19.

Mr. Bernards was surprised by this result. Bernards Dec. ¶ 10. He did not expect that the addition of a tetrazole would lead to a uniformly etched surface. Bernards Dec. ¶ 10. In fact, at the time Mr. Bernards and his co-inventors filed the application, tetrazoles were not known in the art as compounds which can improve the uniformity of a controlled etch. Bernards Dec. ¶ 10. As a result of their discovery, applicants called the tetrazole component of their adhesion promoting composition a "uniformity enhancer." Bernards Dec. ¶ 10.

Thus, Mr. Bernards discovered during the course of his experimentation that the particular combination of an oxidizer, a pH adjuster, a topography modifier (a five membered aromatic fused N-heterocyclic ring compound with at least one nitrogen atom in the N-heterocyclic ring, where at least one of the nitrogen atoms in the heterocyclic ring is bonded directly to a hydrogen atom), ***and a tetrazole*** (the uniformity enhancer) leads to the unexpected and beneficial result of a uniformly etched surface. Bernards Dec. ¶ 11. Nothing in Ferrier '503 would lead a person of ordinary skill in the art to expect this particular benefit if he or she were to combine a benzotriazole or a benzimidazole with a tetrazole as the "corrosion inhibitor" for that reference. For this reason, applicants submit that it would not be obvious from the teaching of Ferrier '503 to make the particular combination of compounds that would result in the applicants' claimed subject matter.

A showing of unexpected results supports the nonobviousness of a claimed invention. Thus, applicants submit that rejected claims 1, 2, 10 and 12 are not obvious, and respectfully request that the Examiner acknowledge their allowability. The same holds true for new claim 21, which depends from claim 1.

Claims 3-9 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ferrier '503 in view of Adlam et al. (5,861,076). Applicants submit that claims 3-9 are patentable because they are all dependent on claim 1, which has been shown to be patentable above. Nonetheless, applicants also traverse the ground for rejection that is advanced in the Office action. In particular, a skilled artisan would not find it obvious to combine the teachings of Ferrier '503 with Adlam '076 to arrive at the post-dip step that is recited in applicants' claims. Adlam '076 pertains to a more traditional black oxide coating

process, whereas Ferrier '503 pertains to an alternative oxide process in which the copper surface is both etched and modified. It is submitted that one of skill in the art would not necessarily consider the teachings of the older black oxide art to be applicable to the more recently developed alternative oxide processes. In addition, Adlam '076 does not disclose the use of aluminates at all as coupling agents. Therefore, Adlam '076 is particularly inapplicable to claim 9 in the present application. For the reasons given above, applicants submit that claims 3-9 are in condition for allowance.

Claim 11 was rejected under 35 U.S.C. §103(a) as being unpatentable over Ferrier '503 in view of Bishop et al. (6,284,309). Applicants submit that claim 11 is patentable because it is dependent on claim 1, which has been shown to be patentable above. Nonetheless, applicants also traverse the ground for rejection that is advanced in the Office action. In particular, a skilled artisan would not find it obvious to combine the teachings of Ferrier '503 with Bishop '309 to arrive at the supplemental use of a copper salt that is recited in applicants' claim 11. Bishop '309 makes use of a copper complex (which could be a copper salt) to ostensibly promote adhesion. However, the copper complex of Bishop '309 is always used in conjunction with a "copper complexing agent." *See* Col. 4, lines 2-3. By inference, the copper complex and the copper complexing agent of Bishop '309 work in conjunction to achieve the desired adhesion characteristics, which apparently involves precipitating copper from the solution onto the copper surface.

Ferrier '503, by way of distinction, does not disclose the use of a copper complexing agent, and it is submitted that the composition of Ferrier '503 primarily etches, or ***removes***, copper from the surface rather than precipitating additional copper onto the surface. Therefore, one of ordinary skill in the art would perceive no particular benefit to

adding a copper complex from Bishop '309 to the adhesion promoting composition of Ferrier '503. It is further noted that applicants explain that a copper salt may be added to the claimed adhesion promoting composition in order to "protect virgin stainless steel surfaces, such as those of a process tank" (page 16, lines 1-6), not to encourage precipitation of copper onto to the copper surface. This further supports the nonobviousness of the combination of Ferrier '503 with Bishop '309 to arrive at the subject matter of applicants' claim 11. For the reasons given above, applicants submit that claim 11 is in condition for allowance.

Conclusion

The applicant has shown that this application satisfies all the legal requirements pointed out by the Examiner. Therefore, the Examiner is respectfully requested to prepare a Notice of Allowability allowing all the pending claims 1-12 and 21.

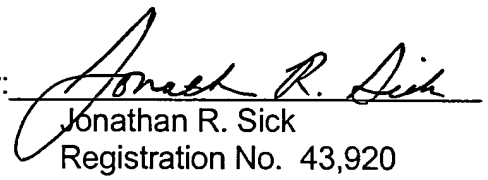
The Examiner also noted that Table 1 of the application lacks comments and results for Examples 5 and 6, and requested that the Applicants supply the missing information. As Mr. Bernards states in his declaration, in each of Examples 5 and 6, the copper surface was desirably uniformly etched. In other words, the treated copper surfaces of Examples 5 and 6 showed no defect. Bernards Dec. ¶ 12.

If the Examiner has any questions or the Applicants can be of any assistance, the Examiner is invited and encouraged to contact the Applicants at the number below.

The Commissioner is authorized to charge any necessary fees or credit any overpayment to the Deposit Account of McAndrews, Held & Malloy, Account No. 13-0017.

Respectfully submitted,

McANDREWS, HELD & MALLOY, LTD.

By: 
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